

Formal criteria for interpreting Chinese serial verb constructions

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Abstract

This paper proposes some formal criteria for interpreting serial verb constructions with two or more verb phrases denoting two or more separate events. This kind of constructions can have the consecutive, alternating, circumstance or purpose interpretation. Since it is the meanings of the individual verb phrases which determine the possible interpretation a serial verb construction may have, and the relationship between the two verbs is largely temporal, a set of formal criteria for interpreting the constructions based on a temporal framework is suggested. The SER (Speaking/Event/Reference) system is used as the basis of the formal criteria and it is argued that these criteria can be exploited computationally when an interpretation of a serial verb construction is to be arrived at.

Keywords

Formal Criteria, Serial Verb Constructions, Consecutive Interpretation, Alternating Interpretation, Purpose Interpretation, Circumstance Interpretation, SER system.

1 Introduction

Chinese serial verb constructions refer to constructions which contain “two or more verb phrases or clauses juxtaposed together without any marker indicating what the relationship is between them” (Li and Thompson 1981:594). Many linguists have given different classifications of Chinese serial verb constructions, such as Li and Thompson (1981), Zhu (1982), etc. According to Li and Thompson (1981), there are serial verb constructions consisting of two or more verb phrases denoting two or more separate events, serial verb constructions with the first verb phrase being the subject of the second verb phrase, pivotal constructions, etc. According to Zhu (1982), there are serial verb constructions with the durative aspect marker *zhe* or the perfective aspect marker *le* in the first verb phrase, serial verb constructions with *lai* “come” or *qu* “go” to show the purpose, and serial verb constructions with *you* “have” as the first verb, etc. In this paper, I will examine, from a formal perspective, serial verb constructions consisting of two or more verb phrases denoting two or more separate events as documented by Li and Thompson (1981), suggesting a set of formal criteria for interpreting their meanings.

According to Li and Thompson (1981), serial verb constructions consisting of two or more verb phrases denoting two or more separate events can have the consecutive, alternating, purpose or circumstance interpretations. The following examples demonstrate the different interpretations.

- (1) ta mai piao jin qu
 he buy ticket enter go
 (He bought a ticket and went in. [consecutive])
- (2) ta xie xin hui ke
 he write letter see caller
 (He writes letters and receives callers. [alternating])
- (3) ta mai piao jin qu
 he buy ticket enter go
 (He bought a ticket to go in. [purpose])
- (4) wo men kai hui tao lun nei ge wen ti
 we open meeting discuss that CL problem
 (We discussed that problem in the meeting. [circumstance])

It is suggested that the meanings of the individual verb phrases determine the possible interpretation a serial verb construction may have, and the speech context determines the most likely interpretation (Li and Thompson 1981:597). Although there is no explicit conjoining markers to show the relationship between the verb phrases, it is often argued that the link between the two verbs in this kind of serial verb construction is temporal

(Sebba 1987:1), and that there is some relationship in *time* between the events denoted by the verb phrases of constructions having the consecutive, alternating or circumstance interpretation (Li and Thompson 1973:99, emphasis added).

In the following sections, a set of formal criteria for interpreting the meanings of the different verb phrases of serial verb constructions with two or more verb phrases denoting two or more separate events will be suggested¹. The criteria are proposed based on the assumption that in order to come up with an interpretation deterministically², we need a formalized mechanism to govern our choice. The SER (Speaking/Event/Reference) system will be used as the basis for the temporal discussion and representation of the formal criteria.

2 The SER System

The SER (Speaking/Event/Reference) system was originated by Reichenbach (1947) and developed by Bull (1960) and is often used by linguists for analyzing tense and aspect (e.g. Binnick 1991). Within this system, there are three points in time, namely the moment of speaking (S), the time of the event (E) and the reference time (R), which are important for describing the temporal relationship between events. An expanded version of this SER system is suggested by Hofmann (1993), in which the times of the event are further specified to include the starting (beginning) point of the event (B) and the final point of the event (F). For example, B_x represents the starting point of event x and F_x represents the final point of event x . This expanded SER system is adopted as the underlying theory throughout the paper in the temporal discussion of the events.

3 Conditions for Consecutive Interpretation

The following serial verb constructions have the consecutive interpretation:

- (5) ta mai piao jin qu
he buy ticket enter go
(He bought a ticket and went in. [consecutive])
- (6) ta shang lou shui jiao
he ascend building sleep
(He walked upstairs and went to sleep. [consecutive])
- (7) women jin ru dian ying yuan kan dian ying
we enter cinema see movie
(We went into the cinema and saw a film [consecutive])

The above sentences receive a consecutive interpretation because the people concerned can be seen as doing the first event followed by the second. The order of the events for a consecutive interpretation is significant: the first event must be done *prior to* the second³. The notion of *completion* is also significant : the first event must be completed before the second is done. Without completion the second event cannot be said to have occurred after the first. In this connection, the first event should be *discrete* from the second. The time lapse between the completion of the first event and the execution of the second is also vital. If the first event was done, say, two days before the second, the two events cannot be said as consecutive events. Nobody would agree so. In order for two events to be considered consecutive, the time lapse between the endpoint of the first event (F_1) and the starting point of the second event (B_2) should be minimal.

The above shows the criteria required for a sentence to be considered as having the consecutive interpretation. To encode these criteria formally, we have the following conditions:

For a serial verb construction consisting of two verb phrases denoting two separate events, event 1 and event 2, the following conditions hold for a consecutive interpretation :

- a. Event 1 is discrete from event 2.
- b. Event 1 is completed before event 2 is done.
- c. The time lapse between the endpoint of event 1 (F_1) and the starting point of event 2 (B_2) is minimal.

A serial verb construction has a consecutive interpretation if and only if conditions a - c are satisfied. Conditions a - c are the *necessary* and *sufficient* conditions for a consecutive interpretation to hold.

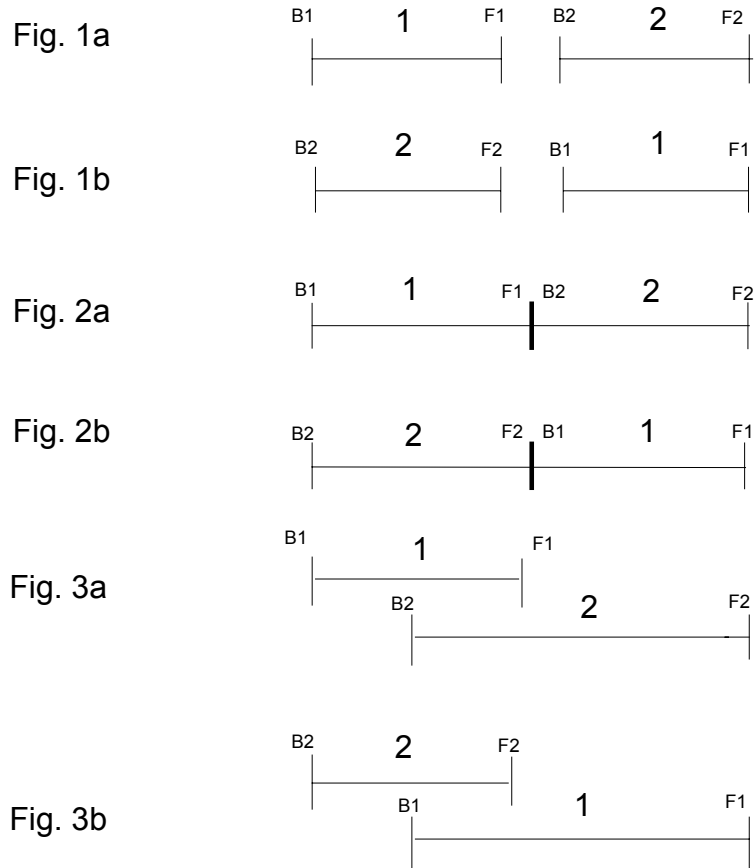
Though convincing enough, the above formalism is not valid unless we have a clear, formal representation of the notions of discreteness (condition a), prior completion (condition b) and the notion of the time lapse being minimal (condition c). It is the combination of the formal criteria and the formal definitions for discreteness, prior completion and the time lapse being minimal which determines whether a serial verb construction has the consecutive interpretation.

3.1 Notion of Discreteness

An event 1 is said to be *discrete* from another event 2 if and only if the starting point of event 2 (B_2) occurs after (figure 1a) or coincide with (figure 2a) the endpoint of event 1

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(F_1), or the starting point of event 1 (B_1) occurs after (figure 1b) or coincide with (figure 2b) the endpoint of event 2 (F_2). If the starting point of event 2 (B_2) occurs before the endpoint of event 1 (F_1) (figure 3a), or if the starting point of event 1 (B_1) occurs before the endpoint of event 2 (F_2) (figure 3b), the two events are NOT discrete from each other. Discreteness is a notion applicable to *two or more* events.



In the above figures, 1, 2 denote the two events in question. B_1 is the starting point of event 1, F_1 the endpoint of event 1, B_2 the starting point of event 2, and F_2 the endpoint of event 2. To formalize the notion of discreteness, we have the following conditions:

$$\text{Event 1 **Discrete from** Event 2 iff } B_1 < F_1 \leq B_2 < F_2 \vee B_2 < F_2 \leq B_1 < F_1$$

3.2 Notion of Prior Completion

An event 1 is said to have *completed prior* to another event 2 if and only if the endpoint of 1 (F_1) occurs prior to or coincide with the starting point of 2 (B_2).

$$\text{Event 1 Completed prior to Event 2 iff } B_1 < F_1 \leq B_2 < F_2$$

3.3 Notion of Being Minimal

It is difficult to say how minimal the time lapse between the endpoint of event 1 (F_1) and the starting point of event 2 (B_2) should be, but apparent from the notion of prior completion, the time lapse can be as small as zero, as the two points in time can coincide. Yet how big the time lapse should be, we cannot tell. Should it be 10 minutes, 20 minutes, longer, or shorter? If the first event was done, say, two hours before the second event, can we say that the two events are consecutive? It is hard to reach a consensus on this. If we are to set a limit to the time lapse between the two events, the limit can only be arbitrary. A better solution is to look at the time lapse from a negative perspective, i.e. to rule out cases which are obviously NOT consecutive. When one utters a sentence like (5 - 7) above and to consider it having a consecutive interpretation, one will expect that the two events are to be done in sequence, or have been done in sequence. One will not expect that one of these two events has already been completed at the moment of speaking but the other is still not to be carried out. From this hypothesis, we can say that with respect to the moment of speaking (S), if the first event has been completed but the second event not to be carried out, then the two events cannot be said as consecutive, i.e., Event 1 and Event 2 are **NOT consecutive** if $F_1 < S < B_2$.

The above schema says that if the endpoint of event 1 (F_1) occurs before the moment of speaking (S) but the starting point of event 2 (B_2) occurs after it, then the two events cannot be consecutive. As discussed previously, this schema is asserted from a negative perspective : It rules out cases where the two events are obviously not consecutive, but it does not specify under what circumstances two events can be said as consecutive.

Therefore, it can be argued that if both event 1 and event 2 are future events with respect to the moment of speaking (S), the two events *can be* consecutive provided that conditions a and b are met. Similarly, if both event 1 and event 2 are past events with respect to the moment of speaking (S), the two events *can also be* consecutive provided that the two conditions are met. Yet this argument only shows a possibility - it is *possible* for the two events concerned to be consecutive in these situations, but it is also *possible* for the two events concerned to be NOT consecutive. The final consideration rests on the time lapse

between the events. What the minimum duration of this time lapse should be, no formal criteria can be set to govern.

4 Conditions for Alternating Interpretation

The following serial verb constructions have the alternating interpretation :

- (8) ta xie xin hui ke
he write letter see callers.
(He wrote letters and received callers. [alternating])
- (9) ta zuo che zuo chuan
he sit car sit ship
(He took the bus and the ferry. [alternating])
- (10) ta chang ge tiao wu
he sing song dance dance
(He sang and danced. [alternating])

The above constructions receive an alternating interpretation because the people concerned can be seen as doing the two events denoted by the two verb phrases alternately. For two events to alternate, there must be at least one discrete and completed instance of either event and at least two discrete and completed instances of the other event recurring one after the other with a minimal time lapse. To encode this situation formally, we have the following conditions:

For a serial verb construction consisting of two verb phrases denoting two separate events, event 1 and event 2, the following conditions hold for an alternating interpretation:

- d. Both events, event 1 and event 2, are discrete.
- e. There is at least one instance of one event and two instances of the other event⁴.
- f. Completed instances of both events recur one after the other with a minimal time lapse.

A serial verb construction has an alternating interpretation if and only if conditions d - f are satisfied. Conditions d - f are the *necessary* and *sufficient* conditions for an alternating interpretation to hold. Again, in order to make the above conditions work, we need some formal definitions of the notion of discreteness, and the notion of completed instances of both events recurring one after the other with a minimal time lapse.

4.1 Notion of Discreteness

The notion of discreteness for an alternating interpretation is the same as the notion of discreteness for a consecutive interpretation discussed in section 2.1.

4.2 Notion of Completed Instances Recurring One after the Other with a Minimal Time Lapse

The notion of completed instances of both events recurring one after the other with a minimal time lapse is complicated. To formalize this notion, we need to introduce a set of symbols for the representation of the starting points and endpoints of the different *instances* of the events:

Let i be a variable in the set of positive integers from 1 to infinity

$B_{1(i)}$ be the starting point of the i^{th} instance of event 1

$F_{1(i)}$ be the endpoint of the i^{th} instance of event 1

$B_{2(i)}$ be the starting point of the i^{th} instance of event 2

$F_{2(i)}$ be the endpoint of the i^{th} instance of event 2

then $B_{1(i+1)}$ will represent the starting point of the $(i+1)^{\text{th}}$ instance of event 1

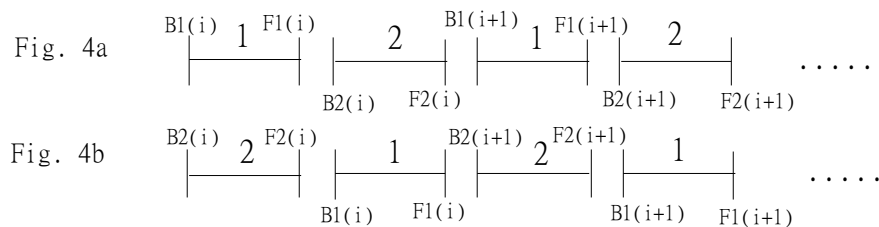
$F_{1(i+1)}$ will represent the endpoint of the $(i+1)^{\text{th}}$ instance of event 1

$B_{2(i+1)}$ will represent the starting point of the $(i+1)^{\text{th}}$ instance of event 2,

$F_{2(i+1)}$ will represent the endpoint of the $(i+1)^{\text{th}}$ instance of event 2,

and so on.

The following figures demonstrate how completed instances of two events recur one after the other (the notion of minimal time lapse is the same as that described in section 2.3 above):



$B_{x(i)} < F_{x(i)} \leq B_{y(i)} < F_{y(i)} \leq B_{z(i+1)} < F_{z(i+1)} \leq B_{a(i+1)} < F_{a(i+1)}$ etc.
 where x, y, z, a , etc. can be either event 1 or event 2

Since there can be an infinite number of ordering patterns, our formalism will become very complicated if it is relaxed in the above fashion. To maintain simplicity and to avoid possible confusion, we will simply adopt the formalism without relaxation for describing the notion of (prototypical) recurrence in this paper.

5 Conditions for Purpose Interpretation

The following serial verb constructions have the purpose interpretation :

- (11) ta mai piao jin qu
 he buy ticket enter go
 (He bought a ticket to go in. [purpose])
- (12) ta shang lou shui jiao
 he ascend building sleep
 (He walked upstairs in order to sleep. [purpose])
- (13) wo men jin ru dian ying yuan kan dian ying
 we enter cinema see movie
 (We went into the cinema to see a film [purpose])⁶

The above sentences receive a purpose interpretation because they can be seen as having the people concerned, who are the *agents* of the actions denoted by the verb phrases, perform the first event *in order to* achieve the execution of the second. For a sentence to have a purpose interpretation, it is important that with respect to a certain time of reference (R), the purpose is a *future* event, i.e. something *to be* carried out, something *to be* achieved. This criterion is asserted based on the inherent meaning of the term *purpose*. A purpose is defined in ordinary dictionaries as "a thing that one intends to do, get, etc." (Hornby 1989), or as "a thing that one wants to achieve" (Collins 1987). In natural language processing, it is taken as something that the agent tries to *make true*, and can be actions or anything that are immediate, or long-term (Hobbs 1990:445)⁷. It is thus apparent in these definitions that a *purpose* is something *future* with respect to a reference time⁸.

The above shows the criteria required for a sentence to be considered as having the purpose interpretation. To encode these criteria formally, we have the following conditions:

For a serial verb construction consisting of two verb phrases denoting two separate events, event 1 and event 2, the following conditions hold for a

purpose interpretation (that event 1 is done for the purpose of event 2, not vice versa):

- g. Event 1 (either completed or being carried out) is done *for the purpose of* carrying out event 2.
- h. Event 2 is a future event with respect to a reference time (R).
i.e., $B_2 > R$
where B_2 stands for the starting point of event 2

A serial verb construction has a purpose interpretation if and only if conditions g and h are satisfied. Conditions g and h are the *necessary* and *sufficient* conditions for a purpose interpretation to hold. However, with these formal criteria, one may not know under what circumstances an event is reckoned as to be done *for the purpose of* another, so the notion of purposefulness needs elaboration.

5.1 Notion of Purposefulness

If an event is said to be done for the purpose of carrying out another event, then the latter cannot exist without the existence (whether completed or still being carried out) of the former. In other words, event 1 is done for the purpose of event 2 if and only if when the starting point of event 1 (B_1) doesn't exist, the starting point of event 2 (B_2) cannot exist either. Whether the endpoint of event 1 (F_1) exists or not is, however, immaterial to our discussion.

Event 1 **for the Purpose of** Event 2 iff $\neg B_1 \rightarrow \neg B_2$

The above schema presupposes some form of *intention* on the part of the agent of the events. Since the starting point of event 2 (B_2) cannot exist without the starting point of event 1 (B_1), the people concerned, i.e. the agents of the events, must have an internal *plan* in mind, which states that they have to perform event 1 which will *enable* the execution of event 2 (Pollack 1990), and as a precondition of a plan is *intention*, the people concerned must first *intend* to execute event 1 and then *intend* it to be a way of executing event 2 (Pollack 1990)⁹.

6 Conditions for Circumstance Interpretation

The following serial verb constructions have the circumstance interpretation :

- (14) wo men kai hui tao lun nei ge wen ti
 we open meeting discuss that CL problem
 (We discussed that problem in the meeting. [circumstance])
- (15) ta nian shu xin hen zhuan
 he read book heart very engrossed
 (He is very engrossed when reading. [circumstance])
- (16) wo shang ke xue Ewen
 I attend lesson learn Russian
 (I learned Russian in the lesson. [circumstance])

The above sentences receive a circumstance interpretation because the people concerned can be seen as doing the second event under the circumstance of the first, i.e. the second event is either simultaneous with the first, or falls within the first. To encode this situation formally, we have the following condition:

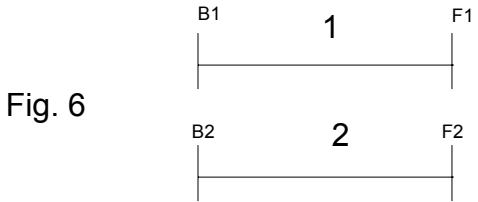
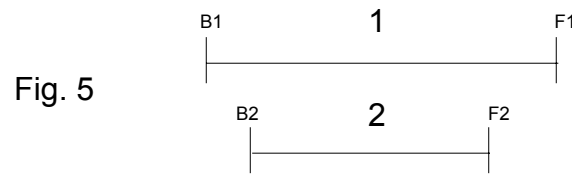
For a serial verb construction consisting of two verb phrases denoting two separate events, event 1 and event 2, the following condition holds for a circumstance interpretation (that event 1 is done under the circumstance of event 2, not vice versa) :

- i. Event 1 spans event 2.

A serial verb construction has a circumstance interpretation (that event 2 is done under the circumstance of event 1) if and only if condition **i** is satisfied. Condition **i** is a *necessary* and *sufficient* condition for a circumstance interpretation to hold.

6.1 Notion of Spanning

The above gives the formal condition for a serial verb construction to have a circumstance interpretation, but the notion of spanning needs further elaboration. An event 1 is said to *span* another event 2 if and only if the starting point of event 2 (B_2) occurs after or at the same time as the starting point of event 1 (B_1) *and* the endpoint of event 2 (F_2) occurs before or at the same time as the endpoint of event 1 (F_1) (figures 5 & 6). Like the notion of discreteness, spanning is a notion applicable to *two or more* events.



A Spans B iff $B_1 \leq B_2 < F_2 \leq F_1$

This idea of spanning conforms to Chan (1974)'s argument on simultaneous actions, which says that “ the initiation of Act₂ [event 2] cannot precede that of Act₁ [event 1] but may or may not end at the same time as Act₁ [event 1]” (Chan 1974:343).

7 Conclusions and Applications

The foregoing discussion gives a formalized mechanism for interpreting a serial verb construction with two or more verb phrases denoting two or more separate events¹⁰. The following table shows a summary of the formal criteria for the different interpretations (consecutive, alternating, purpose and circumstance).

The SER (Speaking/Event/Reference) system is used as the basis for the temporal discussion and representation of the criteria discussed above, and in order to have a computationally tractable mechanism, formal conditions governing the notions of discreteness, prior completion, minimal time lapse, purposefulness, spanning etc. are also set.

The formal criteria suggested in this paper have computational significance. While it is true that the meanings of the individual verb phrases determine the possible interpretations a serial verb construction may have, all the interpretations can only be arrived at through human processing of the construction. In order to come up with an interpretation *computationally*, we need to have a computationally tractable mechanism which requires precise and accessible information for processing. Armed with the proposed set of formal criteria to govern the selection and the different starting and finishing times for the events denoted by the different verb phrases, a natural language processor will be able to assign the possible interpretations to the constructions concerned. Since the formal criteria proposed in this paper are precise and the information needed is easily accessible, the

suggestions in this paper help to bring the computer processing of natural languages into a new era .

Interpretations	Formal Criteria
Consecutive	a. Event 1 is <i>discrete</i> from event 2. b. Event 1 is <i>completed before</i> event 2. c. <i>The time lapse</i> between F_1 and B_2 is <i>minimal</i> .
Alternating	d. Event 1 is <i>discrete</i> from event 2. e. There is at least one instance of one event and two instances of the other event. f. Completed instances of both events <i>recur</i> one after the other with a minimal time lapse.
Purpose	g. Event 1 is done for the <i>purpose</i> of event 2. h. Event 2 is a <i>future</i> event with respect to R.
Circumstance	i. Event 1 <i>spans</i> event 2.

Table 1: A Summary of the Formal Criteria for the Different Interpretations of a Chinese Serial Verb Construction with Two or More Verb Phrases denoting Two or More Separate Events

Notes

1. In this paper, I will only examine serial verb constructions with two or more verb phrases denoting two or more separate events as documented by Li and Thompson (1981), since there is some relationship in *time* between the events denoted by the verb phrases of this kind of constructions and the formal criteria for interpreting these constructions are mainly proposed from a temporal perspective. However, it should be noted that, as stated in the introduction of this paper, there are many other kinds of serial verb constructions documented by different linguists.
2. In the theory of parsing, a "deterministic" process refers to "a process that doesn't search alternatives but rather uses the information it has at the time to choose the correct interpretation" (Allen 1987:161). My use of the term here conforms to this idea. That is, we want to use the formal criteria we have to determine the correct interpretation of a serial verb construction without having to go for other alternative sources of information.

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3. As suggested in Chan (1997), the temporal order of the events concerned is significant, so in order for a construction to have the consecutive interpretation, the event denoted by the first verb phrase has to occur prior to the event denoted by the second verb phrase, not vice versa. This is asserted according to the Principle of Temporal Sequence, which says that "the relative word order between two syntactic units is determined by the temporal order of the state which they represent in the conceptual world" (Tai 1983:50).
4. Condition e for the alternating interpretation is suggested to account for alternation of different lengths, such as the minimum length of 121, 112, 122, 212, 221, 211, with only one instance of one event and two instances of the other event. It can also be used to account for alternation of longer lengths, such as 121212, 212221, 12121212, with two or more instances of both events recurring one after the other.
5. It can be seen that once the condition about completed instances of both events recurring one after the other with a minimal time lapse (condition f) is satisfied, the condition for a consecutive interpretation that the events are discrete (condition a), that event 1 is completed before event 2 is done (condition b), and the condition for the minimal time lapse (condition c) will also be satisfied, since the information conveyed by the conditions a - c is already contained in the information conveyed by condition f.
6. It should be noted that the examples given in this section (examples 11 - 13) are exactly the same as the ones given in the previous section on the discussion of consecutive sentences (examples 5 - 7). As suggested in Li and Thompson (1981), some serial verb constructions can have more than one interpretation, it is unsurprising that sentences used for illustrating a certain interpretation can also be used for illustrating other interpretations.
7. The definition suggested by Hobbs (1990) is actually used to define the term *goal* as used in the field of natural language processing, but since the term *goal* is normally taken as a near synonym of *purpose*, its definition is cited here for the discussion of *purposeful* sentences.
8. Although it is asserted here that a purpose should be a future event with respect to a reference time, what the reference time exactly is depends on the individual sentence and the context, and can be the same as the moment of speaking (S) or different from it.

9. There is no attempt to give a formalized notion of *intention*, since it involves some complex mental attitudes which are outside the scope of this paper. For more details on the discussion of intention and mental attitudes, see Pollack (1990).
10. It should be noted that although the focus of this paper has been put on serial verb constructions with two verb phrases denoting two separate events only, the discussions can actually be expanded to cover constructions with more than two events.

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